BAYOU COURTABLEAU TMDL FOR FECAL COLIFORM

SUBSEGMENT 060204

US EPA Region 6

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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily pollutant loads for those waterbodies. A total maximum daily load (TMDL) is the amount of a pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point sources and nonpoint sources discharging to the waterbody. A TMDL for the May – October season has been developed for fecal coliform bacteria for Bayou Courtableau. Fecal coliform bacteria are monitored as the indicator for potential human health threats resulting from swimming.

There are two flow regimes in Bayou Courtableau which make it two separate bayous rather than one. The source of the water for the eastern section of the bayou is the Atchafalaya River. This section flows into Bayou Teche. The western section of the bayou also flows into Bayou Teche and its source of water is the Bayou Cocodrie/Boeuf system. Bayou Courtableau subsegment 060204 was listed on both the 1998 and the October 28, 1999 Court Ordered §303(d) Lists as not fully supporting the water quality standard for primary contact recreation (swimming). Louisiana's water quality standard for protection of the primary contact recreation use reads as follows:

> "Based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 200/100mL, nor shall more than 10 percent of the total samples during any 30-day period or 25 percent of the total samples collected annually exceed 400/100mL. These primary contact recreation criteria shall apply only during the defined recreational period of May 1 through October 31. During the non-recreational period of November 1 through April 30, the criteria for secondary contact recreation shall apply."

The standard for secondary contact recreation reads similarly:

> "Based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 1,000/100 mL, nor shall more than 10 percent of the total samples during any 30-day period or 25 percent of the total samples collected annually exceed 2,000/100 mL."

Seven months (June, 1998 – December 1998) of monthly LDEQ monitoring data on Bayou Courtableau were assessed to determine if the primary and secondary contact recreation uses were being maintained. Analysis of the data for the November – April season shows that the secondary contact recreation use is being maintained (see Appendix A). Analysis of the data for the May – October season shows that the primary contact recreation use is not protected (see Appendix A). Therefore, a TMDL has been developed to protect the May – October season.

For the purpose of calculating current loading on Bayou Courtableau the average fecal coliform concentration for the May – October season was calculated using monthly LDEQ monitoring data on Bayou Courtableau. In Bayou Courtableau, the monthly fecal coliform counts for this season ranged from 70 cfu/100ml to 1,100 cfu/100ml over the collection period (June, 1998 – October, 1998).

For the purpose of TMDL development, the criterion of 200/100mL was applied. A fecal coliform loading curve for the recreational period (May 1 – October 31) has been generated as Figure 1. This loading curve was developed using Equation 1, substituting the criterion, 200 cfu/100 ml, for FC concentrations and varying flows. The attempt here is to show that while a TMDL may be expressed as a single point it can also be thought of as a continuum of points representing the criterion value and various flow values. A 43% reduction in fecal coliform loading during the May – October season will be needed to protect the primary contact recreation use.

1. Introduction

Bayou Courtableau segment 060204 was listed on both the 1998 and the October 28, 1999 Court Ordered §303(d) Lists as not fully supporting the water quality standard for primary contact recreation (swimming). On the 1998 List, this segment was ranked as a high priority (1) for TMDL development. A TMDL for fecal coliform bacteria was developed in accordance with the requirements of Section 303 of the federal Clean Water Act. The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant; the TMDL also establishes the load reduction that is necessary to meet the standard in a waterbody. The TMDL consists of the wasteload allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The wasteload allocation is the load allocated to point sources of the pollutant of concern, and the load allocation is the load allocated to nonpoint sources. The margin of safety is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions and data inadequacies.

2. Study Area Description

2.1 General Information

Water quality segment 060204 is part of the Vermilion-Teche River Basin. The Basin encompasses the prairie region of the state and a section of the coastal zone. Bayou Courtableau is located in southwestern Louisiana in the Vermillion-Teche River Basin. The Vermilion-Teche River Basin is bounded on the north by the Red River Basin, on the east by the Atchafalaya River Basin, on the west by the Mermentau River Basin and southward by the Gulf of Mexico. Land use in the Vermilion-Teche Basin is largely agriculture, the primary crops being corn, soybeans, and milo. The average annual rainfall in the vicinity of Bayou Courtableau is approximately 57 inches. The land use for Bayou Courtableau watershed is summarized in Table 1.

Table 1. Land Uses in Subsegment 060204

LAND USE TYPE	NUMBER OF ACRES	% OF TOTAL AREA
Urban	125	0.1
Agricultural	76,742	63.8
Forest Land	221	0.2
Water	4,775	4.0
Wetland	38,319	31.8
Rangeland	163	0.1
TOTAL AREA	120,345	100

The area is sparsely populated outside its small municipalities and land use is dominated by agriculture.

2.2 Water Quality Standards

The designated uses for Bayou Courtableau include primary contact recreation, secondary contact recreation, and propagation of fish and wildlife. Fecal coliform bacteria serve as the indicator used for the water quality criteria and for assessment of use support. Louisiana's water quality standard for protection of the primary contact recreation use reads as follows:

> "Based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 200/100mL, nor shall more than 10 percent of the total samples during any 30-day period or 25 percent of the total samples collected annually exceed 400/100mL. These primary contact recreation criteria shall apply only during the defined recreational period of May 1 through October 31. During the non-recreational period of November 1 through April 30, the criteria for secondary contact recreation shall apply."

The standard for secondary contact recreation reads similarly:

> "Based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 1,000/100 mL, nor shall more than 10 percent of the total samples during any 30-day period or 25 percent of the total samples collected annually exceed 2,000/100 mL."

2.3 Identification of Sources

Sources suspected of affecting the water quality of Bayou Courtableau include municipal sources, agriculture, irrigated crop production, and other unknown sources (LDEQ, 1993).

2.3.1 Point Sources

Several minor point sources fall within the subsegment. Many of these facilities are either intermittent stormwater or minor discharges. Five facilities are known to discharge sanitary wastewater into the Bayou Courtableau subsegment. The combined flow of all these discharges is 72,425 gallons per day (see Table 2).

Table 2. Dischargers in Subsegment 060204

Dischargers to Bayou Courtableau			
Facility	Permit #	Design Flow (gal/day)	Wasteload Allocation (lb/day)*
Washington Campground	LAG530762	25,000	1.89E08
Tri-Community Nursing Center/Peace Inc.	LAG540553	10,800	8.18E07
Palmetto Elderly Apartments	LAG540556	25,000	1.89E08
Morrow Housing Project	LAG540685	7,500	5.68E07
Washington Elementary School	LAG540896	4,125	3.13E07
	Totals:	72,425	5.49E08

*see section 3.3 for WLA calculation

2.3.2 Nonpoint Sources

The predominant land uses in the Bayou Courtableau watershed are agriculture and forestry. It is unknown to what extent each of these land uses contributes to fecal coliform loads through runoff. There are also numerous rural residences where other domesticated animals may be found. These rural residences may also contribute to the fecal coliform load if they have septic tanks or septic fields for their wastewater treatment.

3. TMDL Load Calculations

3.1 Current Load Evaluation

Fecal coliform loads have been calculated using the instream bacterial counts and the flow of the stream. The following equation can be used to calculate fecal coliform loads.

Equation 1. C x 1000mL/ L x 1 L/0.264 gallons x Q in gallons/day = cfu/day

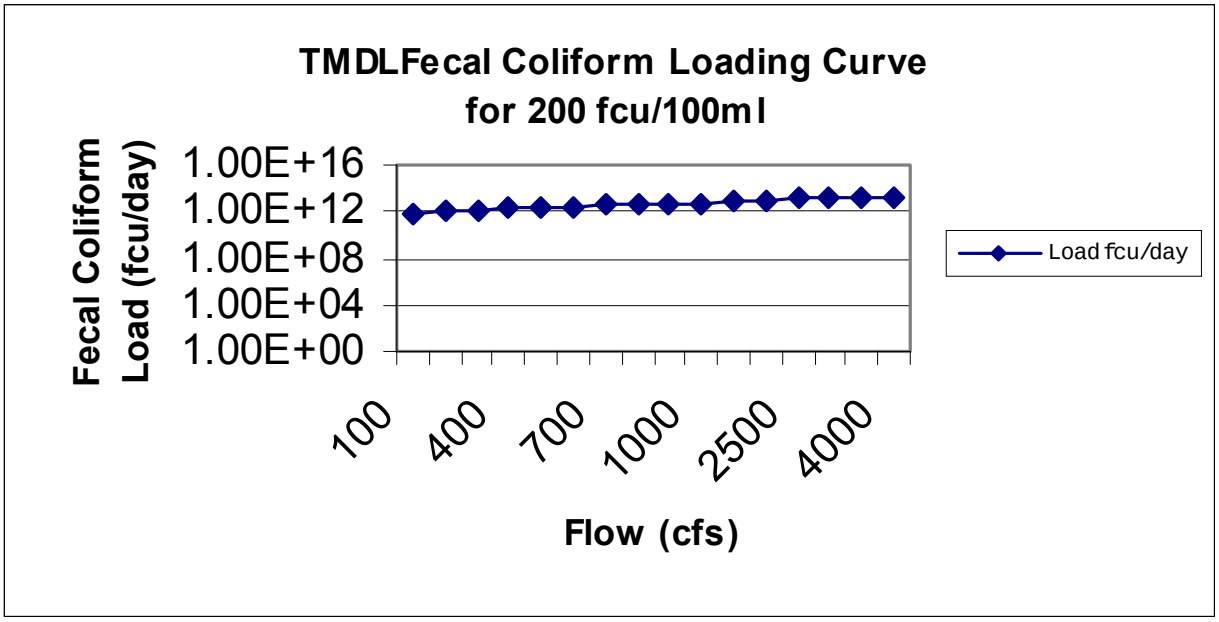
Where: C = colony forming units/100mL
Q = stream flow in gallons/day

A traditional expression of the FC loading may be developed by setting one critical or representative flow and concentration, and calculating the fecal coliform load using Equation 1. The difficulty with this approach is in the determination of the appropriate flow or concentration value to use. For the purpose of calculating current loading on the this waterbody the average fecal coliform concentration for the May-October season was calculated using monthly LDEQ monitoring data on Bayou Courtableau. In Bayou Courtableau, the monthly fecal coliform counts for this season ranged from 70 cfu/100mL to 1,100 cfu/100mL over the collection period (June, 1998-October, 1998). The average fecal coliform count for the May – October season is 346 cfu/100ml (see Appendix A). In addition, the average annual flow for Bayou Courtableau is 520 ft^3/sec (see Appendix B). Using these values and Equation 1 it is estimated that the current loading for the May – October season is 4.4E12 cfu/day.

3.2 TMDL

Point sources usually have a defined critical receiving stream low flow such as the 7Q10 at which the criterion must be met. For nonpoint sources it is recognized that there may be no single critical flow condition. To address this condition, a TMDL fecal coliform loading curve for the recreational period (May 1 – October 31) has been generated as Figure 1. This TMDL loading curve was developed using Equation 1, substituting the criteria, 200 cfu/100 ml, for FC concentrations and varying flows. The attempt here is to show that while a TMDL may be expressed as a single point it can also be thought of as a continuum of points representing the criterion value and various flow values. This curve is not stream dependent but is dependent upon the designated stream criterion. Therefore, it may be applied to any stream with a like FC criterion. This curve represents the TMDL loading allocation for FC.

Figure 1. TMDL Fecal Coliform Loading Curve for the May – October season.



Utilizing Figure 1 one can select a stream flow and can quickly determine the FC loading value. The line formed by this series of points may be thought of as a boundary. At any given flow the loading may be below the line, within the boundary, or above the line. FC load values falling above the line represent disproportionately high values relative to the standard. FC load values falling below the line represent low loads relative to the standard. To develop load reductions one simply needs to determine the appropriate flow value (x-axis) and see where it intersects the load allocation line.

The load reduction needed to meet the water quality standard for primary contact recreation in Bayou Courtableau at 520 cfs is 1.9E12 cfu/day (43% reduction). This was obtained by calculating the allowable TMDL at 520 cfs for the 200 cfu/100ml criterion (2.5E12 cfu/day) and subtracting this load from the observed load (4.4E12 cfu/day).

Current Load - TMDL = Load Reduction

4.4E12 cfu/day – 2.5E12 cfu/day = 1.9E12 cfu/day

3.3 Wasteload Allocation (WLA)

The Louisiana Water Quality Regulations require permitted point source discharges of treated sanitary wastewater to maintain a fecal coliform count of 200 cfu/100 mL in their effluent, i.e., they must meet the standard at end-of-pipe. Therefore, there will be no change in the permit requirements based upon a wasteload allocation resulting from this TMDL.

Equation 1 can be used to calculate the total point source load (wasteload allocation) utilizing a fecal coliform count of 200 cfu/100 mL and the total volume of all the wastewater dischargers (72,425 gallons/day) (Table 2).

200 cfu/100mL * 1000mL/L * 1 L/0.264 gallons * Q gallons/day = WLA

Where Q = Total volume of sanitary wastewater discharges into Bayou Courtableau

WLA for all dischargers = 5.49E08 cfu/day

See Table 2 for individual wasteload allocations.

3.4 Load Allocation (LA)

The load allocation for each season for a given flow can be calculated using Equation 1 and the following relationship:

(TMDL@ given flow and criterion) - (WLA) = LA

LA for May – October season at an instream flow of 520 cfs = 2.4995E12 cfu/day

2.5E12 cfu/day (TMDL@ 520 cfs) – 5.49E08 cfu/day (WLA) = 2.4995E12 cfu/day

3.5 Seasonal Variability

Louisiana has established a seasonal water quality standard for bacteria based upon definition of a summer swimming season and winter secondary contact only. In development of this TMDL, data for all seasons were evaluated and it was determined that a TMDL for the May - October season was needed to protect the primary contact recreation use.

3.6 Margin of Safety (MOS)

The Clean Water Act requires that TMDLs take into consideration a margin of safety. EPA guidance allows for the use of implicit or explicit expressions of the margin of safety or both. When conservative assumptions are used in the development of the TMDL or conservative factors are used in the calculations, the margin of safety is implicit. When a percentage of the load is factored into the TMDL calculation as a margin of safety, the margin of safety is explicit. In this TMDL for fecal coliform, conservative assumptions have been used and therefore, the margin of safety is implicit. These conservative assumptions are:

- Using average flows to calculate current loading to obtain load reduction.
- Using the more conservative 200 cfu/100mL standard rather than 400 cfu/100mL for the summer primary contact recreational season and 1,000 cfu/100mL rather than 2,000 cfu/100mL for the winter season.
- Using the design flow of the point source dischargers rather than actual average flow rates, which are typically much lower

4. Other Relevant Information

Although not required by this TMDL, LDEQ utilizes funds under Section 106 of the federal Clean Water Act and under the authority of the Louisiana Environmental Quality Act to operate an established program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term data base for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program is used to develop the state's biennial 305(b) report (*Water Quality Inventory*) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ nonpoint source program.

The LDEQ has implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over a five-year cycle with two targeted basins sampled each year. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the five-year cycle. Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per site each year. Sampling sites are located where they are considered to be representative of the waterbody. Under the current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been established by the time the first priority basins are monitored again in the second five-year cycle. This will allow the LDEQ to determine whether there has been any improvement in water quality following establishment of the TMDLs. As the monitoring results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) list. The sampling schedule for the first five-year cycle is shown below. The Vermilion-Teche River Basin will be sampled again in 2003.

1998 – Mermentau and Vermilion-Teche River Basins
1999 - Calcasieu and Ouachita River Basins
2000 – Barataria and Terrebonne Basins
2001 – Lake Pontchartrain Basin and Pearl River Basin
2002 – Red and Sabine River Basins

(Atchafalaya and Mississippi Rivers will be sampled continuously.)

In addition to ambient water quality sampling in the priority basins, the LDEQ has increased compliance monitoring in those basins, following the same schedule. Approximately 1,000 to 1,100 permitted facilities in the priority basins were targeted for inspections. The goal set by LDEQ was to inspect all of those facilities on the list and to sample 1/3 of the minors and 1/3 of the majors. During 1998, 476 compliance evaluation inspections and 165 compliance sampling inspections were conducted throughout the Mermentau and Vermilion-Teche River Basins.

5. Public Participation

When EPA establishes a TMDL, 40 C.F.R. § 130.7(d)(2) requires EPA to publicly notice and seek comment concerning the TMDL. Pursuant to an October 1, 1999, Court Order, EPA prepared this TMDL. After submission of this TMDL to the Court, EPA commenced preparation of a notice seeking comments, information and data from the general and affected public. Comments and additional information were submitted during the public comment period and this Court Ordered TMDL was revised accordingly. EPA has transmitted this revised TMDL to the Court, and to the Louisiana Department of Environmental Quality (LDEQ) for incorporation into LDEQ's current water quality management plan.

REFERENCES

LDEQ Ambient Water Quality Database (http://www.deq.state.la.us/surveillance/wqdata/0665col.txt)

LDEQ, 1993. *State of Louisiana Water Quality Management Plan, Volume 6, Part A: Nonpoint Source Pollution Assessment Report*. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge,LA.

____,1998. *State of Louisiana Water Quality Management Plan, Volume 5, Part B: Water Quality Inventory*. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge, LA.

APPENDIX A. Fecal Coliform Data

Bayou Courtableau in Port Barre, Louisiana

This page last updated on: 08/06/00

DATE	TIME	FECAL COLIFORM MPN/100ML	TOTAL COLIFORM MPN/100ML
12/09/98	1030	1600	.
11/24/98	1025	3000	.
11/10/98	0750	240	.
10/28/98	1145	80	.
10/14/98	1036	70	.
09/23/98	1115	1100	.
09/09/98	1050	350	.
08/12/98	1140	240	.
07/29/98	1057	130	.
07/15/98	0900	500	.
06/24/98	1107	300	.

Average Concentration (6/24/98 – 10/28/98) = 346 cfu/100ml

(Reference: http://www.deq.state.la.us/surveillance/wqdata/0665col.txt)

APPENDIX B. Flow Information

Flow in the eastern section of Bayou Courtableau is largely governed by the volume of water pumped from the Atchafalaya River via the Teche-Vermilion Pumping Station in Krotz Springs, Louisiana. According to Ralph Castille, Operations Supervisor of the Teche-Vermilion Pumping Station, the volume of water pumped through the station varies according to downstream water levels in Bayous Courtableau and Teche. Based on information provided by LDEQ, the pumping station presently operates 5 pumps with a maximum pumping capacity of 260 cfs per pump. Between one and four pumps can be operated at any given time, although the actual number in operation varies over time. No pumps are operated during very high flow events. Annual average flow through the pumps is presently unknown. Given the lack of recent ambient flow data on the stretch of Bayou Courtableau between Krotz Springs and Port Barre, we must estimate the average annual flow as a value between 0 cfs (no pumps in operation) and 1040 cfs (4 pumps being operated at full capacity). Taking the average of the minimum and maximum possible values for flow, we estimate flow in this stretch of Bayou Courtableau to be 520 cfs.